Total No. of printed pages = 5

19/4th Sem/DIE 402

2022

TRANSDUCER AND SIGNAL CONDITIONING

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Part – A and Part – B.

PART – A

Answer *all* questions.

1. (a) Determine the input and output variables for the following transducers : 1×10=10

(i) Potentiometric accelerometer, (ii) Photovoltaic Cell, (iii) LVDT, (iv) Carbon Microphones, (v) Synchro, (vi) Hall Effect Transducer, (vii) Ultrasonic Transducer, (viii) Seismic Pickup, (ix) Techo-generator and (x) Shaft Encoder.

[Turn over

(b) Fill in the blanks : 1×10=10

(i) _____ strain gauge has highest gauge factor.

(ii) Inductance of an element is inversely proportional to _____.

(iii) Capacitance of a parallel plate capacitor is given by the relation _____.

(iv) The secondary coils in LVDT are connected in _____.

(v) _____ shows piezoelectric properties.

(vi) LDR is made of _____.

(vii) _____ is an active transducer.

(viii) Change in inductance is converted to voltage using _____ circuit.

(ix) Load cells are used for _____ measurements.

(x) Capacitive transducers are used for _____ measurements.

PART – B

Answer any *four* questions.

2. (a) Describe the construction and working of bonded strain gauges and semiconductor strain gauges using suitable diagrams. 8

   (b) Draw the circuit diagram of a carbon microphone and explain its operation. 7

   (c) Determine the voltage output across A and B for the following circuit (Figure 1): 5

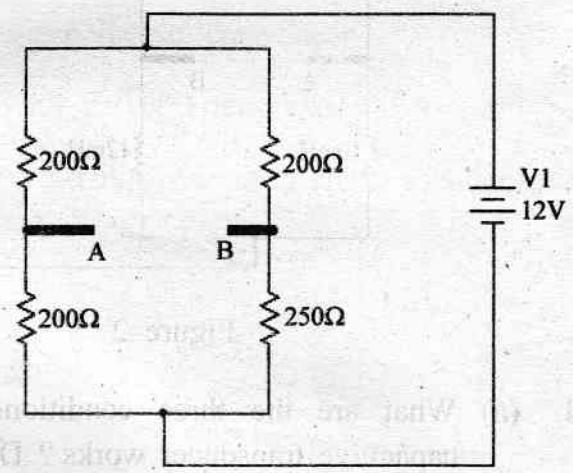

Figure 1

3. (a) Describe the basic principle of working of inductive transducer using suitable diagrams and relevant mathematical expressions. 8

(b) Using a suitable diagram, explain the working of LVDT. 6

(c) Determine the voltage output across A and B for the following circuit (Figure 2) : 6

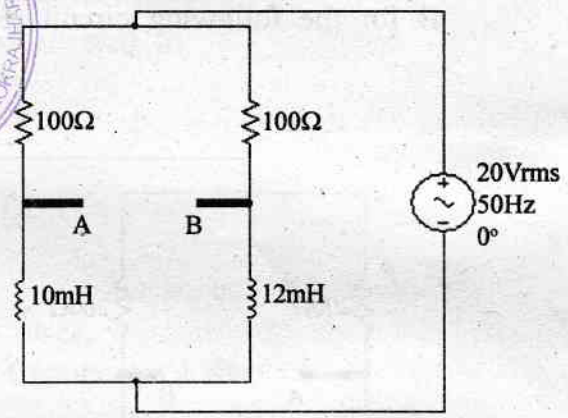

Figure 2

4. (a) What are the three conditions on which capacitive transducer works ? Describe each of them using suitable diagrams and mathematical expressions. 10

(b) Deduce the expression for output voltage in a differential capacitive transducer. 10

5. (a) Explain the operation of the following optical transducers using structural diagram and I-V characteristics :

(i) Photovoltaic Detectors.

(ii) Photodiode. 7×2=14

(b) Explain the working of an ultrasonic transducer. 6

6. (a) Write short notes on any *two* : 7×2=14

(i) Techo-generator

(ii) Piezoelectric Transducer

(iii) Hall Effect Transducer.

(b) Draw the diagram of a shaft encoder and explain its operation. 6